

[54] **CIRCUIT INTERRUPTER**
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[51] Int. Cl. **H01h 85/02**
[58] Field of Search **337/178, 190, 194, 195, 337/217, 218, 221, 291, 199**

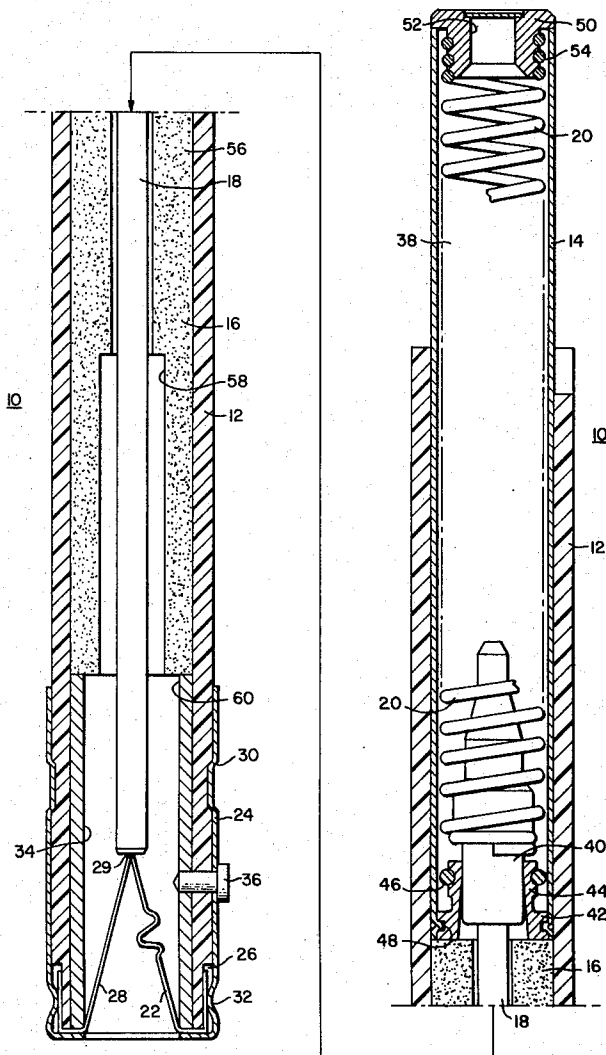
[56] **References Cited**

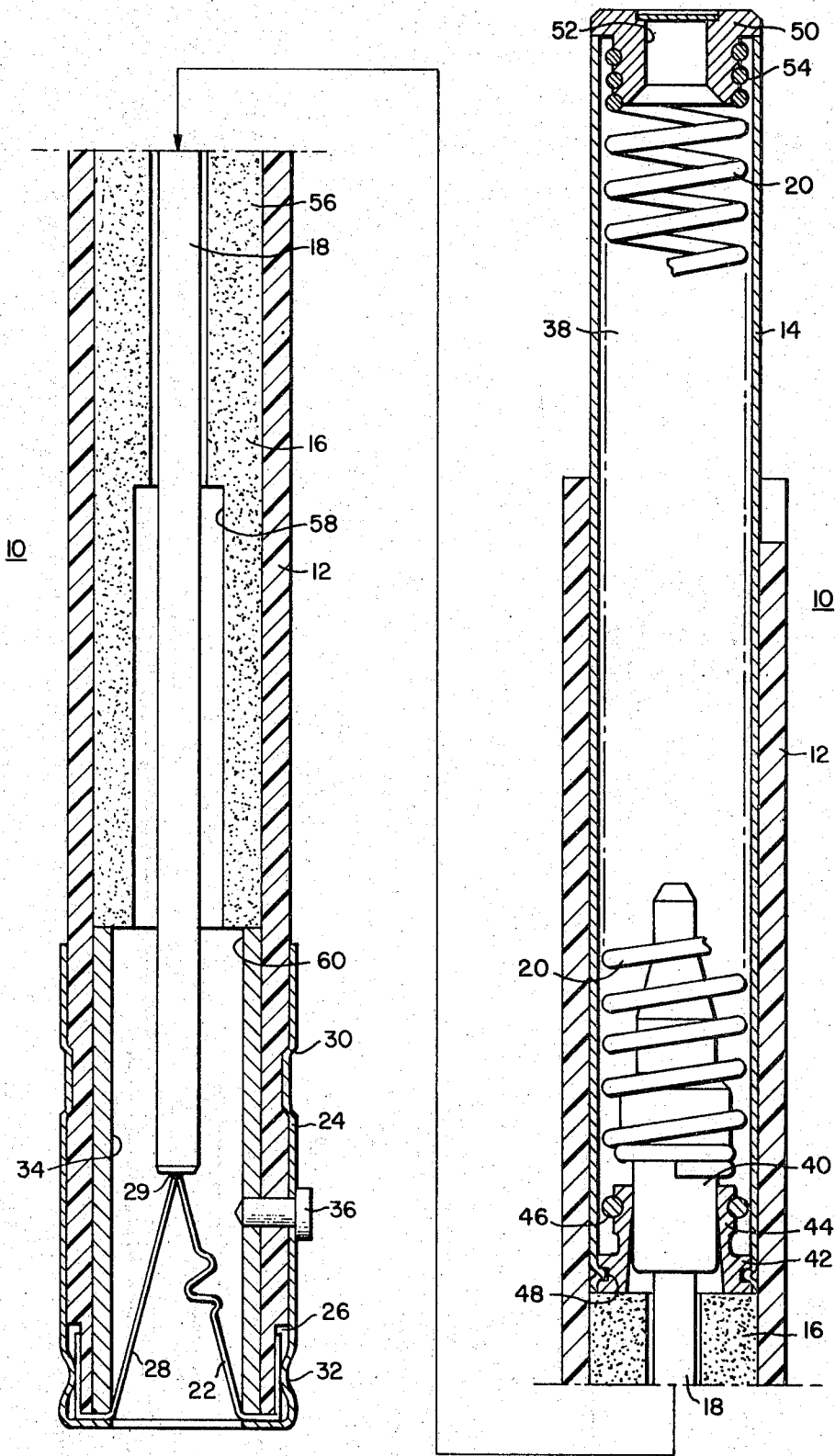
UNITED STATES PATENTS			
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2,590,524	3/1952	Edwards	337/291 X
3,401,243	9/1968	Upton et al.	337/221
3,401,244	9/1968	Patterson	337/178

3,401,245 9/1968 Cameron 337/199
3,401,246 9/1968 Patterson 337/221
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Attorney, Agent, or Firm—L. P. Johns

[57] **ABSTRACT**
A high voltage circuit interrupter characterized by a tubular insulating casing and a tubular conducting casing which are telescopically combined and which contain separable conductors which are normally retained in closed circuit condition by fusible means. One end of the tubular insulating casing includes a ferrule for securing the fusible means in place and which ferrule is form-fitted in place. Likewise, the end of the tubular conducting casing remote from the tubular insulating casing includes an end cap to which the tubular conducting casing is form-fitted. The use of form-fitting for the several parts involved eliminates the need for additional fastening means.

5 Claims, 1 Drawing Figure





CIRCUIT INTERRUPTER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to circuit breakers and more particularly to a high capacity expulsion fuse.

2. Description of the Prior Art

Circuit interrupters of the type involved in this invention are disclosed in U.S. Pat. Nos. 2,590,524, 3,401,243, 3,401,244, 3,401,245, and 3,401,246. These prior art structures employ fusible means for latching conductors in closed circuit positions and are adapted for use in particular mounting means for specialized purposes.

SUMMARY OF THE INVENTION

Generally, the high voltage circuit interrupter of this invention comprises a tubular insulating casing, a body of arc-extinguishing material disposed inside of and spaced from the ends of the casing and having a bore therethrough which bore preferably includes segments of increasing diameter, an elongated conducting member within the bore, terminal means at one end of the casing comprising a tubular conductor within the casing and in the spacing between the end of the body of arc-extinguishing material and said end of the casing. The circuit interrupter also comprises a ferrule at the exterior of the end portion of the casing, fusible means extending between the end of said elongated conducting member and the tubular conductor and comprising an end portion secured between the casing and the ferrule, the ferrule being form-fitted to the casing end portion for retaining the fusible means in place. The circuit interrupter also comprises a tubular conducting casing seated within the other end of the tubular insulating casing and extending outwardly therefrom, an annular conductor between the tubular conducting casing and the elongated conductor member, the tubular conducting member being form-fitted to the periphery of the annular conductor, a helical tension spring between the elongated conductor member and the end of the tubular conducting member remote from the tubular insulating casing effective to move the elongated conducting member away from the fusible means upon fusion of the fusible means, an end cap within the end of the tubular conducting casing to which cap the helical spring is mounted on the periphery thereof, and the tubular conducting casing being form-fitted to the periphery of the assembly of the end cap and helical spring.

The advantage of the circuit interrupter of this invention is a simplified structure having a minimal number of parts which provides a compact high capacity expulsion fuse at lower cost, and utilizes modern construction techniques to facilitate quick assembly with minimal assembly tool requirements.

BRIEF DESCRIPTION OF THE DRAWING

The single FIGURE of the drawing is a vertical sectional view of a high voltage circuit interrupter of the expulsion fuse type.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the drawing an expulsion fuse is generally indicated at 10 and it comprises a tubular insulating casing 12, a tubular conducting casing 14, a body 16 of arc-

extinguishing material such as boric acid, a contact rod 18, biasing means such as a helical tension spring 20, and fusible means such as a fuse element 22.

The tubular insulating casing 12 is composed of a suitable insulating material, such as filament wound glass epoxy, and is provided at one end with a ferrule 24 which is composed of a metal such as copper. The ferrule 24 has an inturned flange portion covering the lower end of the casing 12 and encloses annular notch for reduced portion 26 in which outer ends of the fuse element 22 and a strain link 28 are secured by the ferrule.

In accordance with this invention the ferrule 24 is secured in place by peripheral grooves 30 and 32 which are formed by suitable metal deforming methods such as rolling, or preferably by the magnetic forming method, as described in U.S. Pat. No. 3,333,336 issued Aug. 1, 1967. Thus, the form-fitted ferrule 24 is secured on the end of the casing 12 and it retains the ends of the fuse element 22 and strain link 28 in place, the other end being retained in the elongated conducting member by weld 29.

Within the lower open end portion of the casing 12 a tubular conductor 34 is seated in place. A locating pin 36 is seated in aligned apertures in the casing 12 and the tubular conductor 34 which pin serves a primary purpose of locating the fuse pin in place within a mounting means (not shown) and also provides a current path to tubular conductor 34 during interruption.

The conducting casing 14 is an elongated member composed of a metal having good electrical conductivity such as copper. The lower end portion of the casing 14 is snugly fitted within the upper end portion of the casing 12 and has a purpose of providing a chamber 38 in which the helical spring 20 is disposed and into which the rod 18 is retracted by the spring when the fuse element 22 melts or fuses under an excess current. In the circuit closed position of a contact rod 18 the upper end portion, which includes an enlarged head 40, is seated within an annular conductor 42. The conductor 42 comprises a plurality of spaced fingers 44 extending upwardly from the body of the conductor, and an annular coil spring 46 holds the fingers in good electrical contact with the enlarged head 40 of the rod 18. As shown in the drawing the annular conductor 42 includes a peripheral groove 48 in which an inturned annular end portion of the casing 14 is embedded in a form-fitted manner such as by Magneforming such as described above.

The upper end of the conducting casing 14 includes an end cap 50 having a central bore 52. The upper end portion of the helical spring 20 is secured at 54 to the outer surface of the end cap 50 and the assembly of the end cap and spring is in turn secured in place within the casing 14 by a form-fitted joint such as by Magneforming. Thus, the assembly of end cap 50, the spring 20, and the casing 14 are secured together without the use of additional fastening means.

The body 16 of arc-extinguishing material is a single elongated tubular member disposed between the annular conductor 42 and the tubular conductor 34. The upper end portion 56 of the bore of the body 16 has a smaller diameter than a lower portion 58 which in turn has a smaller diameter bore 60 relatively low the conductor 34. This construction facilitates extinguishment of an arc of both low and high current densities which occurs when the helical tension spring 20 retracts the

rod 18 upwardly from the closed circuit position as shown in the drawing. The preferred composition of the body 16 is boric acid from which emanates water vapor and other arc-destroying vapors and which creates a turbulent, high-pressure deionizing environment when exposed to an arc.

Finally, the fuse element 22 is preferably composed of a material, such as silver, having a high coefficient of electrical conductivity. However, the strain link 28 having a primary purpose of retaining the rod 18 in the lowermost closed circuit position, as shown in the drawing, is composed of a material having a relatively coefficient of electrical conductivity and high strength such as a nickel-chromium alloy. Accordingly, when a current overload of sufficient magnitude passes through the fuse 10, the fuse element 22 is fused and the current selects the alternate route through the strain link 28 of higher electrical resistance, melting the strain element and thereby relieving the retaining force on the rod 18 and permitting the spring 20 to retract the rod to the upper, open circuit position.

What is claimed is:

1. A high voltage circuit interrupter comprising a tubular insulating casing, a body of arc-extinguishing material disposed inside of and spaced from the ends of the casing and having an opening extending axially therethrough, an elongated conducting member axially movable within the opening, terminal means at one end of the casing comprising a tubular conductor within the tubular insulating casing and in the spacing between the end of the body of arc-extinguishing material and said end of the casing, a ferrule on the exterior of the end portion of the casing, fusible means extending be-

tween the end of said member and the tubular conductor and comprising an end portion secured between the casing and the ferrule, the ferrule being form-fitted to the casing end portion for retaining the fusible means in place, a tubular conducting casing seated within the other end of the tubular insulating casing and extending outwardly therefrom, an annular conductor between the tubular conducting casing and the elongated conductor member, the tubular conducting member being form-fitted to the periphery of the annular conductor, and a helical spring between the elongated conductor member and the end of the tubular conducting member remote from the tubular insulating casing effective to move the elongated conducting member away from the fusible means upon fusion of the fusible means.

2. The high voltage circuit interrupter of claim 1 in which a strain link is disposed between the elongated conducting member and the corresponding end of the tubular insulating casing, and the strain link having a higher coefficient of resistance than the fusible means.

3. The high voltage circuit interrupter of claim 1 in which the annular conductor comprises a peripheral groove, and the tubular conducting casing having an annular end flange form-fitted in the peripheral groove.

4. The high voltage circuit interrupter of claim 1 in which an end cap is disposed in the end of the tubular conducting casing remote from the tubular insulating casing, and the helical spring being attached to the end cap.

5. The high voltage circuit interrupter of claim 4 in which the tubular conducting casing is form-fitted to the end cap.

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